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Section :- A

Assignment :- 1

Subject :- Hydraulic Structure.

Describe loads on bridge foundation due to scour and there working mechanism

Ans

Bridge scour is a major cause of bridge failures and has emerged as a significant concern for bridge engineers. Most studies focous on the scour mechanism, modeling, detecting and monitering and countermeasures. To detect or monitor the scour, the scour effect on the response and feature change of the bridge structure should be studied first to choose an effective measurement. Currently very few studies have performed on the scour ~~measurement~~ consequences. Now it is investigated that the scour effect on the

responses of the active bridge, including the superstructure and substructure, and even the response on the vehicles traveling on the bridge which in turn could be used to detect or moniter scour of foundation. A field bridge with scour history was adopted, and the bridge vehicle wave interaction was considered. First, the soil model, scour model, and wave loads were created. The free ~~wave loads~~ vibrations and dynamic analyses under wave loads were then conducted on a single pile and pile groups with different scour depths. The results indicate that the scour effect on the substructure response is very significant.

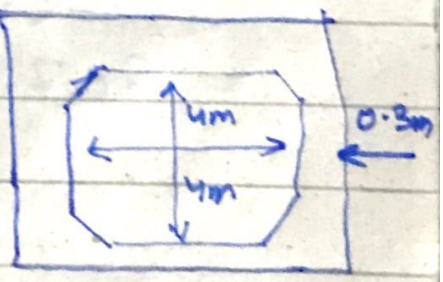
Box Culvert Design

Problem:- A box culvert is to be designed having inside dimensions 4x4m. The culvert is subjected to L.L 50 KN/m² of superimposed DL of 12.8 KN/m² unit wt of soil is 18 KN/m³. Angle of repose 30° Use M25 grade concrete of Fe415 steel. Design the Box culvert for load combination of D.L, L.L and soil pressure.

Data: L.L = 50 KN/m²

D.L = 12.8 KN/m²

θ = 30°



① Load calculation:

- Total load carring on top slab = self wt of slab + L.L + D.L
- Self wt of topslab = 0.3 x 25 = 7.5 kN/m²

W = Total Load = 7.5 + 50 + 12.8 = 70.3 KN/m²

② Coefficient of Earth pressure:-

$$K_a = \frac{1-\sin\phi}{1+\sin\phi} = \frac{1-\sin 30}{1+\sin 30} = 0.33$$

(i) Lateral pressure due to (DL+L.L)

= Total Vertical load (LL+DL) × K_a

= (50 + 12.8)(0.33)

= 20.724 KN/m²

(ii) Lateral pressure due to soil = $K_a \times \gamma h$

= 0.33 × 18 × 4.3

= 25.7 KN/m²

(iii) Lateral pressure at top = lateral pr. due to (DL+LL)

= 20.724 KN/m²

at Bottom = Lateral Pr. due to (DL+LL) + Lateral Pr. due to soil

= 20.724 + 25.7 = 46.7 KN/m²